

### 430.1 DESCRIPTION

This work consists of backfilling bridge abutments and sills.

### 430.2 MATERIALS

- A. Porous Backfill:** The porous backfill material shall conform to the requirements of Section 800 with the following modifications:

The material shall consist of natural sand. Crushed material is not acceptable. The percentage of material passing a No. 200 (75  $\mu$ m) Sieve shall not exceed two percent.

- B. Aggregate Base Course:** The aggregate base course material shall conform to Section 882 with the following modification:

The percent of material passing the No. 200 (75  $\mu$ m) Sieve shall be zero to five percent.

- C. Geotextile Fabric:** The geotextile fabric shall conform to Section 831.1 (MSE Geotextile Fabric).

- D. Drainage Fabric:** The drainage fabric shall conform to Section 831.1 (Drainage Fabric-Type B).

- E. Polyethylene Sheeting:** The polyethylene sheeting shall be minimum thickness of 6 mils (0.152 mm) and shall be sufficiently durable such that it will not puncture or tear when installed as intended.

**F. Drainage Tubing:**

- 1. Corrugated Polyethylene Drainage Tubing:** Corrugated polyethylene drainage tubing shall conform to Section 990.

- G. Black Steel Pipe:** Shall conform to ASTM A53.

- H. Vertical Drain Composite:** The vertical drain composite shall be a geocomposite sheet drain material consisting of a drainage core with a subsurface drainage geotextile attached to or encapsulating the core. Include all necessary fittings and material to splice one sheet, panel, or roll to the next.

The drainage core shall be of a material using long chain synthetic polymers composed at least 85 percent by mass of polypropylene, polyester, polyamide, polyvinyl chloride, polyolefin, or polystyrene. The core shall be fabricated in sheets, panels, or rolls of adequate strength to resist installation stresses and long-term loading conditions. The core shall be built up in thickness by means of columns, cones, nubs, cusps, meshes, stiff filaments, or other approved configurations. The geocomposite sheet drain shall have a minimum compressive strength of 40 psi (275 kPa) when tested in accordance with ASTM D 1621 Procedure A. Splices, fitting, and connections shall be of sufficient strength to maintain the integrity of the system during construction handling

and under permanent loading without impeding flow or damage to the core. The geocomposite drain material shall be covered with an opaque, ultraviolet resistant, waterproof covering during storage. The maximum allowable exposure to ultraviolet radiation prior to installation is 10 days.

The horizontal and vertical flow of water within the geocomposite sheet drain shall interconnect at all times for the full height of the core. The drainage core with the geotextile laminated to one side of the core shall provide a minimum flow rate of 5 gallons per minute (19 liters per minute) per foot (300 mm) of width when tested in accordance with ASTM D 4716 under the following test conditions:

1. 12 inch (300 mm) long specimen
2. Applied load of 10 psi (69 kPa)
3. Gradient of 1.0
4. 100 hour seating period
5. Closed-cell foam rubber between platens and geocomposites

If the core construction separates the flow channel into two or more sections, only the flow rate on the in-flow face is considered in determining the cores acceptability.

The geotextile shall be firmly attached to the core so folding, wrinkling, or other movement cannot occur either during handling or after placement. Attachment shall be through the use of a nonwater-soluble adhesive, heat sealing, or other method recommended by the manufacturer. Adhesive shall not be used on areas of the geotextile fabric where flow is intended to occur. Heat sealing shall not weaken the geotextile below the required strength values.

### 430.3 CONSTRUCTION REQUIREMENTS

**A. Bridge End Backfill Excavation:** No more than two days prior to placement of the bridge end backfill, the approach berm shall be excavated to the established lines and grades, scarified to a minimum depth of six inches (150 mm), and recompact to a minimum of 97% of maximum dry density as determined by SD 104 (AASHTO T99). If due to unforeseen circumstances, the bridge end backfill cannot be placed within two days of the bridge end backfill excavation, the area shall be re-scarified to a minimum depth of six inches (150mm) and re-compacted.

**B. Underdrain:** The underdrain system shall be installed prior to placement of the backfill. The underdrain system shall consist of the following:

1. Polyethylene sheeting shall be placed to the specified limits in the bottom of the excavation and attached to the abutment backwall with a construction adhesive. The polyethylene sheeting shall be placed on impervious soil that has been graded to drain away from the roadway at a rate of 1/8 inch per foot (10 mm per meter). Lapped joints in the polyethylene sheeting shall be placed transverse to the direction of flow with a one foot (300 mm) minimum overlap in the direction of flow. Vehicles and equipment shall not be operated directly on the polyethylene sheeting.

2. A vertical drain composite shall be rigidly attached to the abutment backwall such that it will remain in place during backfilling. The method of attachment shall be in accordance with the manufacturer's literature and approved by the Engineer. Overlap of the vertical drain composite at splices shall be a minimum of three inches (75mm). Horizontal splices shall be such that the top section of vertical drain composite is over the top of the lower section.
3. Place a minimum of two inches (50 mm) of porous backfill material in the bottom of trench and on top of the polyethylene sheeting. Care shall be taken such that no damage occurs to the polyethylene sheeting during placement of the porous backfill. The porous backfill material shall be shaped to receive the four inch (100mm) diameter slotted drainage tubing such that the drainage tubing will be immediately adjacent to vertical drain composite and will drain away from the roadway at a rate of 1/8 inch per foot (10 mm per meter). The slotted drainage tubing shall be placed immediately adjacent to the vertical drain composite. The underdrain shall be backfilled with porous backfill to the specified limits. The porous backfill shall be placed in one foot (300 mm) layers without compaction. The porous backfill shall be uniformly spread without segregation, contamination, or damage to the polyethylene sheeting.

**C. Backfill Placement:** Prior to backfill placement, drainage fabric shall be placed to the specified limits. The surfaces on which the drainage fabric is to be placed shall be smooth and free of obstructions. Lapped joints in the drainage fabric shall be placed transverse to the direction of flow with one foot (300 mm) minimum overlap in the direction of flow. Vehicles and equipment shall not be operated directly on the drainage fabric.

Aggregate base course shall not be placed until at least 24 hours after completion of the deck pour. In addition, aggregate base course shall not be placed until the abutments and sills, including wingwalls, have attained full design strength.

Aggregate base course shall be placed in loose lifts not to exceed eight inches (200 mm) and compacted to 97% of maximum dry density. The moisture at the time of compaction shall be 4%  $\pm$  of optimum moisture. Maximum dry density and optimum moisture will be determined in accordance with SD 104.

Upon completion of the backfill placement but prior to the placement of the approach slab, drainage fabric and polyethylene sheeting shall be placed to the limits shown in the plans. Lapped joints in the drainage fabric or polyethylene sheeting shall be placed transverse to the direction of flow with one foot (300 mm) minimum overlap in the direction of flow. Vehicles and equipment shall not be operated directly on the drainage fabric and polyethylene sheeting.

When specified for phased construction, the edge of the first phase of bridge end backfill that is between phases shall be mechanically stabilized in accordance with the plans details and the following:

1. Each layer of aggregate base course shall be placed in six inch (150 mm) lifts. The placement and compaction of each layer must be inspected and approved by the Engineer prior to placement of the next layer.

2. Any equipment used to install the bridge end backfill over the geotextile fabric shall be operated in such a manner that the geotextile fabric is not damaged. To avoid damage to the geotextile fabric, the equipment used to place, spread, and compact the aggregate base course over the geotextile fabric shall not be operated on less than six inches (150 mm) of material.
3. The geotextile fabric may be oriented in any direction. To minimize the horizontal deflection of the mechanically stabilized vertical face, it is extremely important to make sure that the geotextile fabric is taut and free of wrinkles during placement of the aggregate base course.
4. Any geotextile fabric that is torn or punctured shall be repaired or replaced by the Contractor at no additional cost to the Department. The repair shall consist of a patch of the same type of geotextile fabric being placed over the ruptured area such that it overlaps the damaged area a minimum of 3 ft. (1 m) from any damaged edge. A sewn patch meeting the same requirements for seam strength as that of the fabric being repaired is allowed.
5. Seams that are perpendicular to face of the mechanically stabilized backfill may be constructed by overlapping the fabric a minimum of two feet (0.6 m). All other seams, as well as those in which the two foot (0.6 m) minimum overlap cannot be accomplished, shall be sewn. All seams shall be inspected by the Engineer and any deficient seams repaired by the Contractor prior to placement of the next layer of aggregate base course. Geotextile fabric that is joined by sewn seams shall have strength properties at the seam equal to the specified strength requirements of the geotextile fabric. High strength polyester, polypropylene, or kevlar thread shall be used for sewn seams. Nylon threads shall not be used. The edges of the fabric shall be even and shall be completely penetrated by the stitch.
6. During periods of shipment and storage, the geotextile fabric shall be enclosed in a heavy duty opaque wrapping such that the fabric is protected from direct sunlight, ultraviolet rays, dirt or debris. The fabric shall not be subjected to temperatures greater than 140°F (60°C).

#### 430.4 METHOD OF MEASUREMENT

- A. **Bridge End Backfill Excavation:** The quantity specified on the plans is the theoretical quantity based on plans dimensions . The plan quantity will be the quantity accepted for payment. Field measurement for Bridge End Backfill Excavation will not be made.
- B. **Bridge End Backfill:** The quantity specified on the plans is the theoretical quantity based on plans dimensions. The plan quantity will be the quantity accepted for payment. Field measurement for Bridge End Backfill will not be made.
- C. **Bridge End Backfill Underdrain Pipe:** The plan quantity will be the quantity accepted for payment, and will include drainage tubing and black steel pipe and vertical drain composite, when specified. Field measurement for Bridge End Backfill Underdrain Pipe will not be made.

**430.5 BASIS OF PAYMENT**

- A. Bridge End Backfill Excavation:** The accepted quantity will be paid for at the contract unit price per cubic yard (cubic meter). Payment will be full compensation for all labor, equipment and all other items incidental to excavating the material to the limits shown on the plans.
- B. Bridge End Backfill:** The accepted quantity will be paid for at the contract unit price per cubic yard (cubic meter). Payment will be full compensation for all labor, equipment, materials, water, and all other items incidental to scarifying, reshaping and recompacting the area to be backfilled, furnishing and installing the polyethylene sheeting, drainage fabric, geotextile fabric, and furnishing, placing, and compacting the porous backfill and aggregate base course to the limits shown on the plans.
- C. Bridge End Backfill Underdrain Pipe:** The accepted quantity of pipe will be paid for at the contract unit price per foot (meter). Payment will be full compensation for labor, equipment, materials and incidentals for furnishing and installing the drainage tubing, black steel pipe, and vertical drain composite.

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